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THE ALLITERATION IN SHAKESPEARE'S SONNETS:  
A STUDY IN LITERARY BEHAVIOR

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## THE ALLITERATION IN SHAKESPEARE'S SONNETS: A STUDY IN LITERARY BEHAVIOR\*

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Alliteration is one of the most familiar forms of sound-patterning in poetry and prose. It is said to exist when two or more syllables beginning with the same consonant occur near each other in a given passage. Examples of alliteration are frequently cited as contributing to the effect of a literary work, and it is usually implied that they represent deliberate acts of arrangement on the part of the writer. If this is true, alliteration should throw some light on the dynamics of verbal behavior and especially upon a process which may be called 'formal perseveration' or, better, 'formal strengthening.' Studies of word-association, latent speech (1), and so on, have indicated that the appearance of a sound in speech raises the probability of occurrence of that sound for some time thereafter. Stated in a different way: the emission of a verbal response temporarily raises the strength of all responses of similar form. The principal characteristics of poetry (alliteration, assonance, rhyme, and rhythm) seem to be exaggerated cases of the tendency toward formal strengthening, and they should supply useful information with regard to it.

In order to determine the existence or the importance of any process responsible for a characteristic pattern in a sample of speech, it is necessary to allow for the amount of patterning to be expected from chance. We cannot assert, for example, that any one instance of alliteration is due to a special process in the behavior of the writer rather than to an accidental proximity of words beginning with the same sound. Proof that there is a process responsible for alliterative patterning can be obtained only through a statistical analysis of all the arrangements of initial consonants in a reasonably large sample. In the case of alliteration what we want to know is the extent to which the initial consonants are not distributed at random. If the distribution turns out to be random, then no process by virtue of which words come to be arranged on a formal basis can be attributed to the behavior of the writer, even though

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selected instances still show the grouping commonly called alliteration.

If there is any process in the behavior of the writer by virtue of which the occurrence of an initial consonant raises the probability of occurrence of that sound for a short time thereafter, then the initial consonants in a sample of writing will be grouped. Methods are, of course, available for detecting a tendency toward grouping, but in the case of poetry a more appropriate technique can be based upon the use of the line as a natural unit. In any large sample of poetry certain lines will contain no occurrences of a given initial consonant, and others will contain one, two, three, and so on, occurrences. From the relative frequency of the consonant we may calculate these numbers if we assume that the probability of occurrence remains unchanged and that each occurrence is an independent event. A process of alliteration, if it existed, would violate these assumptions and yield a greater number of lines containing more than one occurrence and also a greater number of empty lines.

This paper presents some facts concerning the alliterative patterns in a block of one hundred Shakespeare sonnets. The material is drawn from a more extensive research on a number of different kinds of sound-patterns, to be reported in full later. The sonnets were first scanned according to a set of arbitrary rules, designed to prevent unintentional selection and at the same time to single out the most important syllables in each of the 1,400 lines. The average number of syllables per line thus designated was 5.036, which agrees well with the pentametric form of the poems. The range, however, was from three to eight. A tabulation of initial consonants by line was then made.<sup>1</sup> The results were expressed for each consonant separately in the form of (1) the number of lines containing no occurrences, (2) the number containing one occurrence, (3) the number containing two occurrences, and so on.

The formula for the number of lines containing 0, 1, 2, . . . occurrences of a given initial consonant involves the binomial expansion  $N(q + p)^n$ , where  $N$  is the number of lines examined,  $n$  the number of syllables per line,  $p$  the probability of occurrence

<sup>1</sup> The tabulation was made by Miss Marian Kruse and Miss Janette Jones, Federal Aid Students at the University of Minnesota.

of the consonant under consideration (obtained from its frequency in the whole sample), and  $q$  the probability of occurrence of any other sound, or  $1 - p$ . The successive terms in the expansion give the numbers required. A good approximation could have been obtained by letting  $n = 5$ , which is close to the average number of important syllables, but a more accurate estimate was obtained by calculating separately for lines of different length according to the lengths in the sample. Calculations were made for 277 lines of four syllables (including a few in the original sample which contained only three), 830 lines of five syllables, 252 of six, and 41 of seven (including a few originally of eight).<sup>1</sup> By adding the occurrences obtained from these separate calculations, the total chance expectancy for that consonant was obtained.

Before the observed and calculated frequencies may legitimately be compared for our present purposes, a spurious alliterative effect in the observed values must be taken into account. Shakespeare, perhaps more than most other English poets, tends to repeat a word (or to use an inflected form) within the space of a line. There are two repetitions, for example, in the line:

Suns of the world may stain when heaven's sun staineth

In tabulating initial consonants, this line must be counted as containing four *s*'s. It is clear, however, that the last two must be attributed not only to formal strengthening but to some thematic source. The line as heard is strongly sibilant, but two of the *s*'s are due to something beyond a simple alliterative process.

In a line containing a repeated word it is at present impossible to determine how the responsibility for the similarity of sound is to be divided between formal and thematic factors. To omit all repeated words from the present tabulation would obviously not be justified; at the same time we cannot accept at full value the instances of alliteration for which they are responsible. In the following summary the raw data (obtained by counting all initial sounds regardless of repetition of the whole word) are presented

<sup>1</sup> The formula for the five-syllable lines, for example, is

$830 (q^5 + 5q^4p + 10q^3p^2 + 10q^2p^3 + 5qp^4 + p^5)$ ,  
the successive terms giving the number of lines containing 0, 1, 2, 3, 4, and 5 occurrences of the consonant for which  $p$  and  $q$  were calculated.

TABLE 1

Consonant	NUMBER OF OCCURRENCES PER LINE												p																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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first. The revised values obtained by subtracting the instances arising from repetition are then given.

In Table 1 the initial consonants are arranged in order according to the frequency with which they occur in the block of 100 sonnets. The numbers of lines containing 0, 1, 2, 3, 4, or 5 occurrences per line observed for Shakespeare and calculated as described above are shown in their respective columns. The last column gives the significance of the difference between observed and calculated values expressed in terms of the probability that the difference is due to sampling.

From the table it will be seen that the least frequent sound (*qu*) occurs only 23 times and never more than once per line, as we should expect from chance. At the other extreme the sound *s* (which occurs 938 times) fails to occur in 702 lines (the expected number of empty lines being 685) but occurs once in 501 lines (expected: 523), twice in 161 lines (expected: 162), three times in 29 lines (expected: 26), and four times in seven lines (expected: two). If we omit the cases which arise from repeated words, we obtain the figures in parentheses in the table, which show a better agreement. The corrections required in the two-per-line column have merely been estimated and are not shown in the table. An examination of every tenth line showing two occurrences indicates that about 19% of such lines are due to repetition. When this correction is made for *s*, it appears that Shakespeare falls about 30 lines *short* of the expected number of lines containing two *s*'s.

Other consonants in the table show varying degrees of agreement. The estimates of significance (which are in every case based upon the raw data) indicate a possible 'use of alliteration' with *n*, *k*, *h*, *t*, *f*, *b*, and *l*; but these all involve repetition, and the corrected values give very little support to the popular notion. There is possibly a trend in the direction to be expected from a process of alliteration, but the absolute excess of 'heavy' lines is very slight. Some indication of this excess may be obtained from the following statements regarding the table as a whole:

*Lines containing four like initial consonants.* (Ex.: *Borne on the bier with white and bristly beard.*)

Of these lines there are only eight more than would be expected from chance, and four of these are due to the repetition of the same word or words. Not more than once in twenty-five sonnets

(350 lines) does Shakespeare lengthen a series of three like consonants into four, except when he repeats a word.

*Lines containing three like initial consonants.* (Ex.: Save that my soul's imaginary sight.)

Of these lines there are thirty-three too many, but twenty-nine of these are due to repetition of the same word. Only four are, therefore, 'pure' alliteration. Except when he repeated a whole word, Shakespeare changed a line of two like consonants into one of three not oftener than once in twenty-five sonnets.

*Lines containing two like initial consonants.*

There are ninety-two excess lines of this sort, but the correction for repetition gives a *shortage* of approximately forty lines. Allowing for eight lines extended to contain three or four occurrences, we may say that once in about every three sonnets Shakespeare *discarded* a word because its initial consonant had already been used.

These corrections probably go too far, since a repetition of the same word may in part exemplify an alliterative process. Moreover, when instances have been thrown out because they belong to repeated words, the whole table should be recalculated on the basis of a reduced total frequency. This recalculation would affect chiefly the values for the empty lines and for the lines containing one occurrence. As the table indicates, Shakespeare shows in general an excess of empty lines, but most, if not all, of this difference would disappear under recalculation with a smaller total frequency. Similarly, Shakespeare's shortage of one-occurrence lines would be reduced. These changes cannot be made without an arbitrary estimate of the share contributed by alliteration when a word is repeated, but by taking the raw data as the upper limit and the fully corrected data as the lower, the main question proposed in this study may be answered.

In spite of the seeming richness of alliteration in the sonnets, there is no significant evidence of a process of alliteration in the behavior of the poet to which any serious attention should be given. So far as this aspect of poetry is concerned, Shakespeare might as well have drawn his words out of a hat. The thematic or semantic forces which are responsible for the emission of speech apparently function independently of this particular formal property.

It is scarcely convincing to argue that Shakespeare may have arranged certain alliterative patterns and discarded an equal number due to chance, since it is unlikely that the expected frequencies would be so closely approximated. It is simpler to believe that we have been misled by the selection of instances and that no process of alliteration should ever have been attributed to the poet. If 'formal strengthening' proves to be a real characteristic of normal speech, we shall have to look for the key to Shakespeare's genius in his ability to resist it, thereby reversing the usual conception of this kind of poetic activity.

Shakespeare's 'philosophy of composition' might well be expressed in the words of the Duchess, who said to Alice, 'And the moral of *that* is, "Take care of the sense, and the sounds will take care of themselves."'

#### REFERENCE

1. Skinner, B. F., The Verbal Summator and a Method for the Study of Latent Speech. *Jour. Psychol.*, 1936, 2, 71-107.



